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ABSTRACT

The effects of test anxiety on reading comprehension were studied in two experiments. In the first experiment, 75 college students completed a test anxiety scale and the McGraw-Hill Basic Skills System reading comprehension subtest. The low anxious students in this experiment showed higher reading comprehension than the high anxious students. In the second experiment, 102 college students were administered the test anxiety scale and the Nelson-Denny Reading Test, a "speeded" test that requires completion in a short time. None of the students in experiment two finished the test, and there were no significant differences in reading comprehension across high, medium, and low anxiety groups. To examine the "speededness"/anxiety relationship more carefully, the Nelson-Denny test was administered to a group of 19 college students who were allowed to complete the test without a time limit. Under these circumstances, there was some relationship found between anxiety scores and reading scores: however, the differences did not reach the conventional level of statistical significance. (RL)

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The Effects of Anxiety on Reading Comprehension

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ABSTRACT

In this project the authors explore the effects of anxiety on reading comprehension in a series of two experiments. Experiment One investigates anxiety in a How to Study Class principally by comparing scores on Sarason's Text Anxiety Scale with Part III, Comprehension, of the McGraw Hill Basic Skills System reading test. The second experiment compared performance on the Nelson Denny Reading Test for High School and College and scores on the Sarason Anxiety Scale. An analysis of performance by item type revealed that students in Experiment One suffered more on items requiring them to piece together information from more than one place. Students in Experiment Two did not show this same anxiety effect. However, since students in the second experiment were less anxious and worked with a totally different set of items, it is not clear which variables may account for the differences between the two experiments.

Test anxiety, as a scientific concept, is approximately twenty years old (Sarason, 1972). The most common example of test anxiety is the student who consistently earns lower scores on classroom exams than one would expect, knowing that student's tested ability. Another frequent clinical example is the student who reports forgetting well-studied material until after turning in the exam. The truly test anxious student reports a rush of recall, after it's too late. A third, and somewhat less frequent example is the normally fluent reader who, in the middle

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of a paragraph, reports failing to comprehend familiar material. All these phenomena--lower than expected performance, a sudden loss and then return of memory under test taking situations, and unaccountable gaps in reading comprehension--are examples of test anxiety.

There are several studies of test anxiety and its impact on college achievement. Gaudry and Spielberger (1971) reported the relationship between anxiety, grades and college dropouts at Duke University. They found that for low and medium aptitude students, as measured by the College Boards, there was a negative correlation with test anxiety and grades. Only the high aptitude students were able to perform well in spite of high anxiety. And highly anxious students were more likely to drop out of college for academic failure than were low anxiety students, even when ability was held constant. A most illuminating finding, by Sarason (1972), is that under non-threatening or non-testlike conditions, high anxious students do about as well as low anxious students.

There have been some studies of test anxiety and reading. A recent ERIC review by Wildemuth (1977) includes several studies showing a negative relationship between test anxiety and various reading measures in children. Holmes (1972) reports a negative correlation with vocabulary for fourth graders. Johnson and Hummel (1971) report similar negative correlation with vocabulary and paragraph comprehension on the Stanford Achievement for fifth graders. Kestenbalm and Weiner (1970) report a negative correlation with reading performance for seventh and eighth

grade readers. Lombardi (1974) reports, for seventh graders, another negative correlation with reading, at all levels of measured intelligence. Proger (1973) reports for sixth graders that high anxious students profit from abundant advanced organizers. Low anxious students, on the other hand, seem not to need these kinds of aids. Interestingly, there were no reports in the ERIC review of any studies of the relationship between test anxiety and reading in college students. We now report two such studies.

Experiment I

Test Anxiety in a How to Study Class

Subjects in the first study were 75 students in How to Study classes taught at the University of Minnesota. As part of the introductory testing, they filled out the 16-item Test Anxiety Scale (Sarason, 1958). The instrument is developed from the notion that anxiety is a result of negative evaluation. A child being so evaluated by its parents becomes hostile, guilty and eventually anxious. To the extent that a test situation involves the threat of negative evaluation, some of those same emotions may be generated. The test anxious college student pays more attention to the internal feelings of anxiety than to the test item. Consequently, performance is impaired. Sample items from the test are as follows:

1. I wish examinations did not bother me so much.
2. Thoughts of doing poorly interfere with my performance on tests.

3. During tests, I find myself thinking of the consequences of failing.

Scores range from zero to 16. The distribution of scores for the How to Study class are presented in Figure 1. The top and bottom 33% of that distribution, cutting at 6.5 and 11.5, were used to define high and low anxiety within the class.

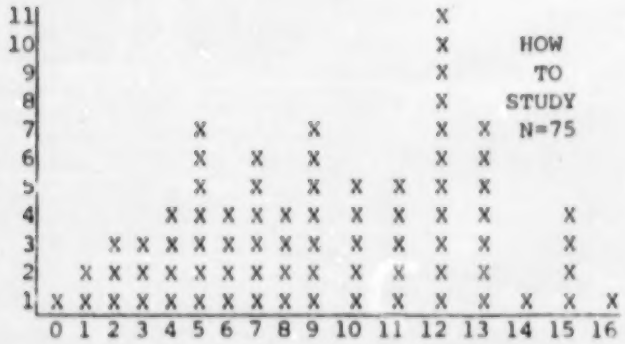
The reading test used in this research was the McGraw-Hill Basic Skills System Reading Test, Form A. Part III, the Comprehension section, was used as the measure of reading comprehension. The test was given under standard conditions, which include a very generous 40 minutes time limit for the 30 comprehension questions. All students finished all items. The scores were examined to find any relationship between levels of test anxiety and reading comprehension.

The reading and anxiety scores were evaluated using a two-way analysis of variance, presented in Table I. The measured variables were anxiety and comprehension. Both main effects were significant, $P < .001$. Low anxious students showed higher comprehension (mean = 23.5) than high anxious students (mean = 18.2).

Another way to interpret the difference between high and low anxiety is to convert the comprehension means to percentiles for freshmen at four-year colleges. The low anxious students fell at the 79 percentile; the high anxious students at the 18th. (In most college-level reading improvement programs in the country, the highly anxious students would

FIGURE I

TEST ANXIETY SCALE SCORES FOR TWO STUDENT GROUPS



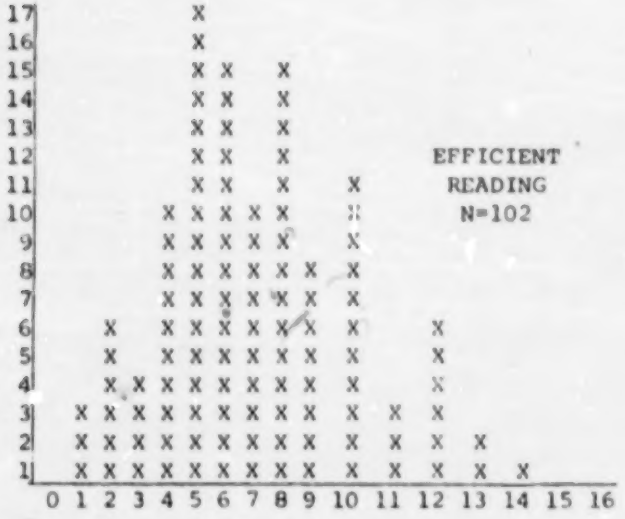


TABLE I

ANALYSIS OF VARIANCE OF TEST ANXIETY AND READING COMPREHENSION

ANXIETY

COMPREHENSION MC GRAW HILL	HO	MED	HI	
LO	19	16.2	14.0	16.57
MED	24.8	19.75	17.66	20.45
HI	28.14	25.22	21.77	24.80
$\bar{X}$	23.5	20	18.2	
%'le	79		34	
r=	= .45		N = 75	

ANOVA

SOURCE	df	S S	M S	F
ANXIETY	2	359.00	179.5	50.70 *
COMPREHENSION	2	862.135	431.08	121.77 *
INTERACTION	4	113.370	28.34	8.005*
ERROR	66	233.926	3.54	

*P < .01

have been categorized as a remedial treatment group.) The interaction between anxiety and comprehension was significant at $P < .001$. Clearly, a student's level of anxiety is related to performance on the McGraw-Hill Reading Test.

Experiment II

Test Anxiety in an Efficient Reading Class

In an effort to expand our sphere of test anxiety research, we tried an experiment with another group of University of Minnesota students. For this treatment, we used the Nelson-Denny Reading Test for High School and College, Form C. The Nelson-Denny is a very well-known and frequently used test for college students and adults. The Nelson-Denny is quite different from the McGraw-Hill and many other tests in that it is "speeded" --that is, the time provided for completing the test is quite short. The primary reason for the short testing time is to allow administration of the complete test during one normal class period. But it also seems to create an interesting situation insofar as test anxiety is concerned: Would speededness increase anxiety effects?

First, we administered the Sarason Anxiety Scale to 102 students registered in three sections of the University of Minnesota Efficient Reading course. Their test anxiety scores are reported in Figure 1. This group was clearly less anxious than was the How to Study class group reported in Figure 1. The anxiety scores were grouped into High, Medium, and

Low Anxiety categories, cutting at 4.5 and 10.5.

The Nelson-Denny Reading Test was administered under standard conditions. The comprehension section of the test allows the student fifteen minutes to read eight separate passages and answer a total of 36 questions. None of the students finished the test. The reading scores were tested by an analysis of variance which found no significant differences between the three anxiety groups. Because of unproportional differences in group sizes, the data could not be tested for an interaction between comprehension and anxiety. Data are reported in the top row of Table 2.

In order to examine the speededness/anxiety relationship more carefully, we administered the Nelson-Denny to a second group of 15 students. They were older than average, registered in evening school, and generally more anxious than even the How to Study students. In this instance, they were given the test-anxiety questionnaire and then the Nelson-Denny under "power" conditions--that is, with no time limits. Under such circumstances, there was some relationship between anxiety scores and reading scores. The product-moment correlation between anxiety and performance was $r = -.45$. While the differences between the three groups (High, Medium and Low Anxiety) did not reach the conventional level of statistical significance, the probability was sufficiently small ($P < .09$) to suggest that with a larger group under higher anxiety and power conditions, even the Nelson-Denny Reading Test is sensitive to

TABLE 2

	HI ANX.	MEDIUM ANX.	LO ANX.
		SPEED CONDITION	
T.A.S.	0 - 4	5 - 9	10+
N	21	62	19
M	41.23	40.70	37.26
			P =.43

		POWER CONDITION	
T.A.S.	0 - 5	6 - 9	10+
N	6	5	8
M	56.00	53.60	46.50
			P= .09 r= +45

READING COMPREHENSION SCORES FOR THREE LEVELS OF TEST ANXIETY UNDER TWO TESTING CONDITIONS.

the effects of test anxiety. The comparison between the speed and power groups is presented in the bottom line of Table 2.

More research into this matter is warranted, however, because the Nelson-Denny is minimally sensitive to anxiety when administered under standard conditions. Perhaps the speededness of the test tends to put everyone under the same threat and thus masks the effects of test anxiety. Alternatively, the effects may have been attenuated in Experiment II because the students were less anxious than those in Experiment I.

We are now left with the intriguing question: By what mechanism does anxiety affect reading comprehension? Some suggestions for an answer may be found in the research literature on anxiety. One theoretical position that may be relevant is the cue utilization hypothesis (Muller, 1976). The general notion is that anxious or aroused subjects use fewer of the available cues in coding stimuli for memory. The type of coding negatively affects recall. Some of the relevant experimental work involved incidental learning (McLaughlin, 1965). For example, if a student's explicit task is to underline all the nouns on several pages of text, his score on an unexpected recall test of those nouns is considered a measure of incidental learning. High anxious subjects tend to show less incidental learning, suggesting they attend to the features of only one task at a time, or that their memory may be impaired by anxiety.

Muller (1976) reports other studies

of the cognitive functioning of high anxiety subjects. In one experiment, he presented a series of words which were to be read, memorized and then repeated back. The word list was designed so that all the items had a type of organization built in One of the lists was designed to have high verbal association between words scattered throughout the list (black-white, king-queen, high-low). The other list was designed to contain words that were related by category (six metals, six animals, six colors). The prediction was that highly anxious students would pay attention to the words, and not the associations or categories. If so, when tested on recall, they would show weak evidence of clustering, reproducing words that were learned close together rather than relating words scattered in the list. That's what Muller found, weaker clustering by anxious students. In another experiment, he also found the same clustering effect for words that had no built-in associations. The less anxious students tended to create their own clusters and recall certain words together, regardless of where they were placed in the original list.

How might we translate these findings on recall and clustering under anxiety to comprehension testing under anxiety? The cue utilization hypothesis is that high anxious students may get part of a message, but miss some of the important details and associations. Consequently, they may miss some of the relationships between ideas. If a comprehension question called for a particular fact, found in a particular place in the reading text, there should be relatively little difference

between high and low anxious students. Students with different levels of anxiety should not be discriminated by that type of item. On the other hand, there may be some questions that require inference and judgment. They would be answered by material that would be found in several places in the paragraph. The reader would have to keep the relevant facts in mind, cluster them, see their associations, and then answer a question. These types of questions, which are answered based on material from various places in the paragraph, might discriminate between high and low anxious students.

These derivations were empirically tested. Questions from the McGraw-Hill test were divided into two types, Type I in which the answer was clearly located in only one place, (Items 51, 53, 55, 57, 61, 62, 63, 64, 65, 74, 77) and Type 2 in which the material needed for the answer appeared in more than one place (Items 54, 56, 58, 59, 66, 67, 69, 71, 72, 73, 76, 78, 79, 80).

The students in the study skills class were categorized into the top and bottom 27%. Then the scores for these two groups of students were computed separately for Type 1 and Type 2 items.

For Type 1, where we predicted no difference for anxiety, the difference was M=3.27, in favor of the low anxiety students. In Type 2, where we expected a greater difference, we found it. The difference was M=4.66, again in favor of low anxiety as we would have expected. The overall difference between the differences, D=1.39, has probability of .058;

very, very close to conventional levels of statistical significance.

DISCUSSION

Test anxiety has been an area of professional concern for two decades. The earliest theory was oriented more toward quasi-psychoanalytical concepts. Experience with punishing and evaluating parents was thought to affect a student's level of anxiety. Testing or classroom procedures that reactivated that emotional learning was considered the source of test performance decriments at the college level, when the test was used for evaluation. More recent research by Wine (1971) has turned investigator's concern from prior history to current performance. What the student attends to while testing is considered more critical than prior parental relations in evaluating test performance. Using that interpretation, Wine has taught students how to look at and analyze test items. Under her regime, anxious students tend to improve their test taking. Meuller's work, on the cue-use hypothesis, is clearly aligned with an attention theory.

The high anxious students in Experiment 1 showed significantly lower reading comprehension. Analysis of their performance by item types suggested that they suffered more on those items requiring that they pull together information from two or more places in the paragraph. They were also operating without any speed constraints. Everyone of them finished all the items. That suggests that they had all the time they wanted to go back and re-evaluate their work. It's worth noting that under a speeded condition, the

students in Experiment 2 did not show anxiety effects. However, there were two confounding differences between the experiments. In the second experiment, the students were less anxious, and were working with a totally different set of items. It is not clear which, if any, of these variables account for the differences between Experiments 1 and 2. Obviously, more work is called for to explicate the theory of test anxiety, and find out more about how the problem affects reading comprehension.

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